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(27) Inventor: Koizumi, Haruhiko

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511-5-205, Chigasaki  
Chigasaki City, Kanagawa(JP)

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(74) Representative: Müller-Wolff, Thomas et al  
HARWARDT NEUMANN,  
Patent- und Rechtsanwälte,  
Postfach 14 55  
D-53704 Siegburg (DE)

(71) Applicant: TOHO TECHNICAL SERVICE CO.,  
LTD.  
3-3-5, Chigasaki  
Chigasaki City, Kanagawa(JP)

(54) Electrolytic ion water generator.

(57) This invention relates to an electrolytic ion water generator to produce alkali ion water containing alkali ions and acid ion water containing acid ions by introducing tap water or the like into an electrolytic cell comprising electrodes and ion exchange membranes arranged alternately which electrolyze the electrolytes in the water.

Electrolytic cell unit panels having the same shape are constructed by attaching the electrode plate and ion exchange membrane onto each synthetic resin frame. The electrolytic cell unit panels are layered in a water-tight manner facing the front sides to front sides and the rear sides to rear sides via O-rings. A water-inlet external cover is attached at one end of the layered electrolytic cell unit panels, and a water-outlet external cover is attached at the other end of the layered electrolytic cell unit panels in a water-tight manner to secure the total assembly.

Since the electrolytic ion water generator of this invention can be assembled just by layering electrolytic cell unit panels of the same shape, the assembly process is simplified and the whole device is compact. By adjusting the number of layered electrolytic cell unit panels, it is simple to manufacture a generator having the required ion water production capacity.

When the flow-pass switching mechanism which is actuated in response to the change of polarity of the electrode plate is installed within a separate panel

inserted in the water-outlet external cover or between the water-outlet external cover and the electrolytic cell unit panel, the scale deposited on the cathode plate during operation can be removed without interrupting the generation of ion water.

FIG. I

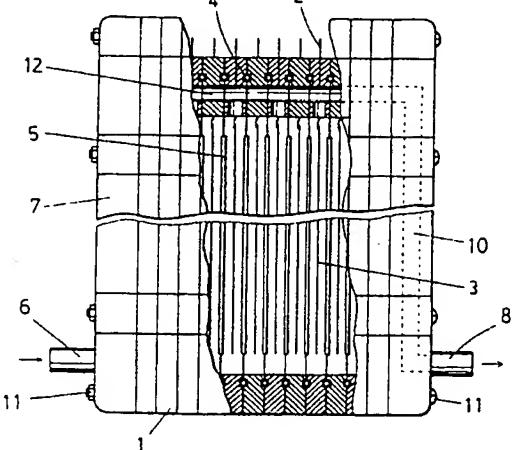


FIG.1

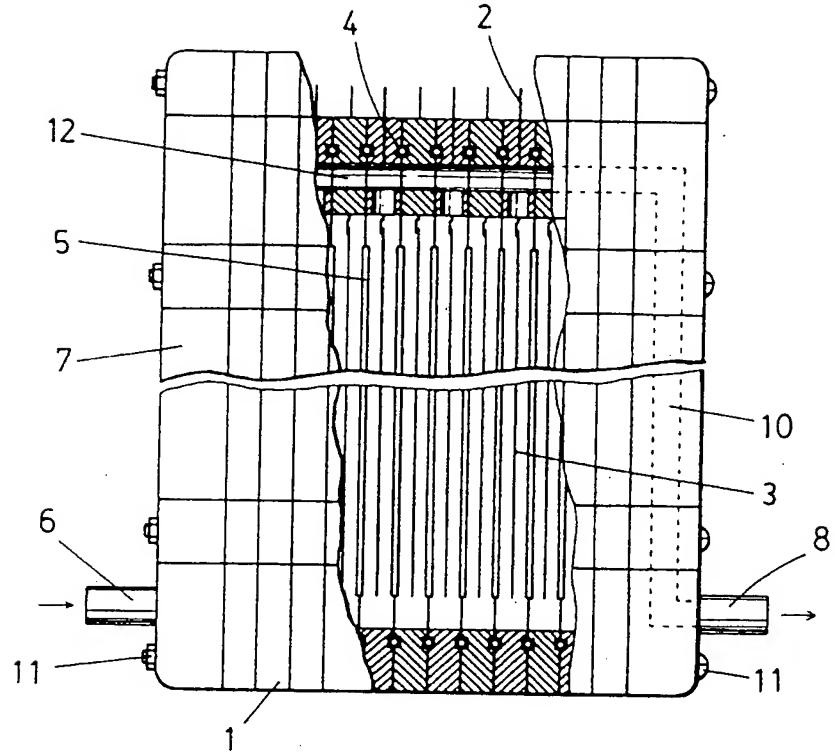


FIG.2

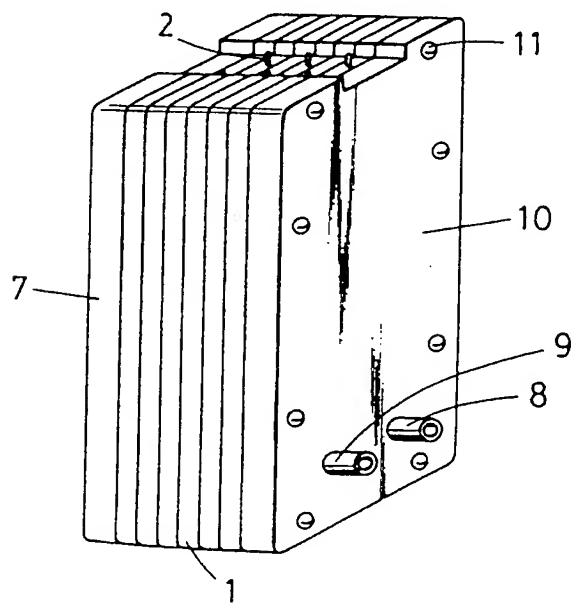


FIG.3

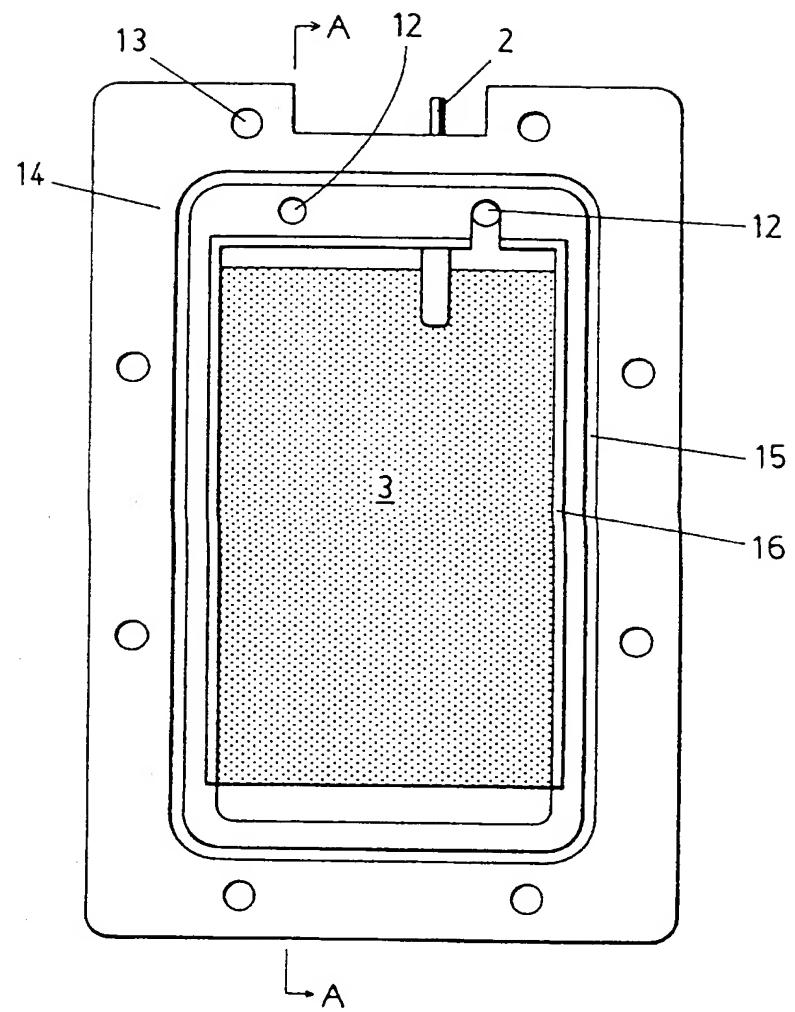


FIG.4

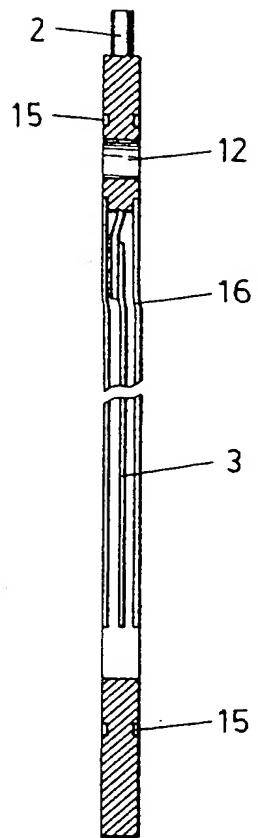


FIG.5

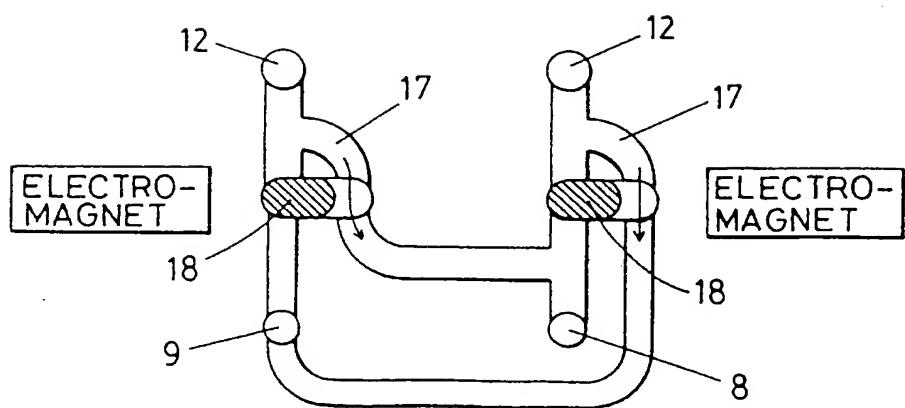
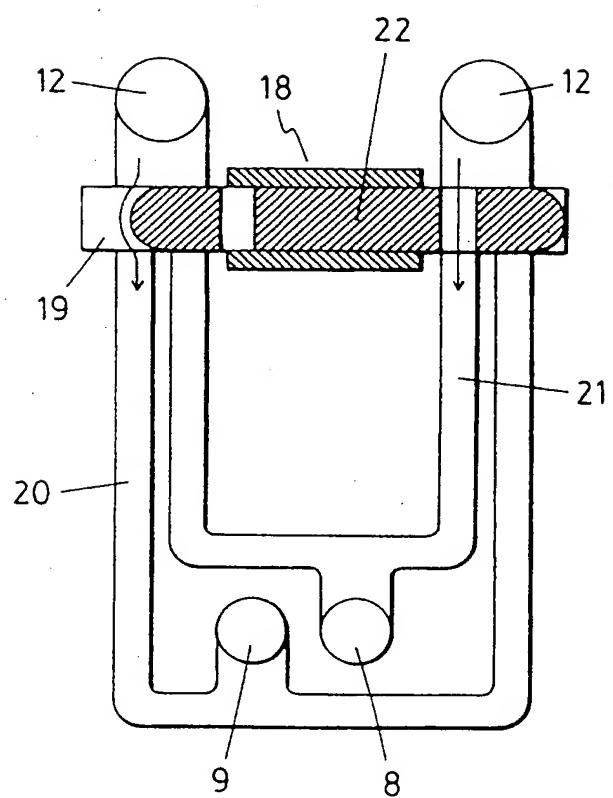


FIG. 6



cover 10 and the electrolytic cell unit panel 1, ion water is continuously generated; the alkali ion water is discharged continuously from the alkali ion water-outlet opening 8, while the acid ion water is discharged continuously from the acid ion water-outlet opening 9, even during electrolytic cell cleaning while changing the polarity of the electrode plates to remove scale from the cathode surface. The deposited scale can thus be removed from the electrodes which act as the cathode during operation of the ion water generator or at the beginning or end of every cycle of operation by changing the polarity, which approximately doubles the life of electrodes.

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the scope of the claims.

#### Reference

#### Description of symbols

1:	Electrolytic cell unit panel	25
2:	Electrode terminal	
3:	Electrode plate	
4:	O-ring	
5:	Ion exchange membrane	30
6:	Water-inlet opening	
7:	Water-inlet external cover	
8:	Alkali ion water-outlet opening	
9:	Acid ion water-outlet opening	
10:	Water-outlet external cover	35
11:	Metal-tightening fixture	
12:	Water flow hole	
13:	Hole	
14:	Frame	
15:	Groove for O-ring	40
16:	Recessed face zone	
17:	Bypass	
18:	Flow-pass switching valve	
19:	Space	
20:	Flow pass	45
21:	Flow pass	
22:	Cylinder valve	

#### Claims

1. An electrolytic ion water generator to generate both alkali ion water containing alkali ions and acid ion water containing acid ions by introducing water into an electrolytic cell comprising electrodes and ion exchange membranes being arranged alternately to electrolyse the electrolytes contained in the water, wherein the electrolytic ion water generator comprises layered electrolytic cell unit panels, a water-inlet external cover being located on one side of the layered electrolytic cell unit panels, and a water-outlet external cover being located on the other side thereof, and wherein the electrolytic cell unit panel comprises a synthetic resin frame, an electrode plate, and an ion exchange membrane, and the synthetic resin frame has holes at specified points on its periphery thereof to accept metal fixtures to fasten the layered frames, has a groove for O-rings at the inner periphery of the row of holes, has a recessed face zone on each front side and rear side of the frame to set the ion exchange membrane, has two water flow holes across the frame at the specified points between the groove for the O-rings and the recessed face zone, and one of the water flow holes opens to the inside of the electrolytic cell, and wherein the electrode plate is located in the electrolytic cell unit panel within the thickness of the synthetic resin frame, and is provided with an electrode terminal at the top thereof which projects from the synthetic resin frame, and wherein the ion exchange membranes are set into the recessed face zones formed on both the front side and rear side of the synthetic resin frame and are arranged so that they face the electrode plates and sandwich them, while keeping a distance between them, and wherein the water-inlet external cover is provided with a water inlet opening connected with the electrolytic cell formed by the electrolytic cell unit panels, and wherein the water-outlet external cover is provided with an alkali ion water-outlet opening connected with one of the two water flow holes to discharge the generated alkali ion water, and an acid ion water-outlet opening connected with the other water flow hole to discharge the generated acid ion water, and wherein the electrolytic cell unit is assembled by layering the electrolytic cell unit panels in a water-tight manner while facing the front sides to front sides and the rear sides to rear sides via the O-rings fitted in the grooves for the O-rings on the electrolytic cell unit panels, by setting the water-inlet external cover and the water-outlet external cover in a water-tight manner, and by fastening by passing metal fixtures through the holes on the synthetic resin frame and tightening.
2. The electrolytic ion water generator of Claim 1, wherein the electrode plate is made of a single material.
3. The electrolytic ion water generator of Claim 1, wherein the electrode plate is made of titanium

coated with a noble metal.

4. The electrolytic ion water generator claimed in Claim 1, 2, or 3, wherein a pair of bypasses are housed within the water-outlet external cover or within a separate panel installed between the water-outlet external cover and the adjacent electrolytic cell unit panel, and the bypasses allow water to flow connecting one of the two water flow holes with the alkali ion water-outlet opening and allow water to flow connecting the other water flow hole with the acid ion water-outlet opening separately, and wherein the flow-pass switching valve, which is activated in response to change of polarity, is mounted in each of the passes between the flow-pass which is opened to the alkali ion water-outlet opening and one of the bypasses, and between the flow-pass which is opened to the acid ion water-outlet opening and the other bypass.

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5. The electrolytic ion water generator claimed in Claim 1, 2, or 3, wherein a horizontally extended space is formed within the water-outlet external cover or within a separate panel installed between the water-outlet external cover and the adjacent electrolytic cell unit panel to connect each of the two water flow holes or the extended portions thereof, and wherein the flow-passes which are opened to the alkali ion water-outlet opening and to the acid ion water-outlet opening are formed side by side, adjacent to the space and opposite to the water flow hole in the space, and wherein a flow-pass switching valve is located within the space and is moved right and left in response to change of polarity such that when one of the two water flow holes opens to the alkali ion water-outlet opening, the valve connects the other water flow hole with the flow-pass which is opened to the acid ion water-outlet opening, and when one of the two water flow holes opens to the acid ion water-outlet opening, the valve connects the other water flow hole with the flow-pass which is opened to the alkali ion water-outlet opening.

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